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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,068	08/29/2001	James Kent Heckman	W2K1062	8680

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EXAMINER	
DOLAN, JENNIFER M	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 08/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/943,068	HECKMAN ET AL.	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 27-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,13 and 27-35* is/are rejected.

7)☒ Claim(s) *10-12 and 36-38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. The declaration filed on 5/12/03 under 37 CFR 1.131 is sufficient to overcome the U.S. Patent Publication No. 2002/0186477 to Wang et al. reference.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 13, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,561,328 to Massingill et al. in view of U.S. Patent No. 6,531,767 to Shrauger.

Regarding claims 1, 2, 13, and 27, Massingill discloses a package including a substrate (15); a die (10); and a template layer (20) attached to a top side of the substrate for aligning the die by contacting the die during placement of the die on the template and the substrate (column 1, line 55 – column 2, line 7; figures 4 and 5), the template layer having an aperture for receiving the die (figure 4), self-alignment features for guiding the die during placement (walls 21; see column 1, line 55-column 2, line 7) and having walls substantially perpendicular to a surface of the substrate for contacting sides of the dies after placement, whereby the dies are precisely located along the surface of the substrate (figures 4 and 5).

Massingill fails to disclose that a plurality of openings are provided to align a plurality of dies, and that the dies comprise mirror sub-arrays.

Shrauger discloses a plurality of mirror sub-arrays (figures 4 and 5). Shrauger further discloses that it is crucial to precisely align the mirror sub-array dies (column 1, lines 7-10; column 2, lines 50-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the alignment template of Massingill is used to align a plurality of MEMS mirror sub-arrays, as suggested by Shrauger. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to use the alignment template of Massingill to align the mirror sub-arrays taught by Shrauger, because Shrauger shows that it is desirable to tile a mirror sub-arrays, in order to effectively use all known good dies in the creation of a larger mirror array (Shrauger, column 2, lines 57-62), but that the mirror sub-array dies must be very precisely aligned to each other and to the substrate in order to maintain beam integrity (Shrauger, column 2, lines 62-67). The template of Massingill provides accurate die placement with a relatively simple fabrication method (Massingill, column 3, lines 4-37), rather than requiring the more complex flip-chip bonding, as well as precise control of the solder bonding used by Shrauger (Shrauger, column 3, lines 25-30), and thus its use in aligning the MEMS mirror sub-arrays would be advantageous and obvious to one skilled in the art.

Regarding claims 3 and 28, Massingill discloses that the template has rectangular apertures for accepting the dies (figures 3 and 4).

Regarding claims 4 and 29, Massingill discloses that the template has protrusions (figures 4 and 5) perpendicular to the mounting surface of the substrate for guiding the dies during placement.

4. Claims 5, 6, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Massingill et al. in view of Shrauger as applied to claims 1 and 27 above, and further in view of U.S. Patent No. 5,446,960 to Isaacs et al.

Massingill discloses that the template layer has rectangular apertures for accepting the dies (figures 3 and 4), and that the walls of the apertures are formed by the protrusions (figures 4 and 5), but fails to disclose that the protrusions are tapered.

Isaacs discloses an alignment plate in which the sidewalls are tapered, having a narrow end farthest from the substrate, so that the dies may self-align as they are guided toward the substrate (figure 2D; column 2, lines 1-49).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the template of Massingill as modified by Shrauger, such that the template protrusions have tapered sidewalls, as taught by Isaacs. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide tapered sidewalls, because Isaacs shows that a tapered sidewall can compensate for gross misalignment between the die and the substrate, such that the die is funneled into its proper location (see Isaacs, column 2, lines 28-49; column 4, lines 52-68).

5. Claims 7, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Massingill et al. in view of Shrauger as applied to claims 1 and 27 above, and further in view of U.S. Patent No. 5,298,791 to Liberty et al.

Massingill discloses means for adhering the die to the substrate (column 3, lines 34-37), but fails to disclose an adhesive layer that is cut to provide vents to permit the escape of gas during mounting of the dies.

Liberty discloses an adhesive layer (1 or 42) which is cut to provide vents to permit the escape of gas during mounting of a circuit component to a heat sink or substrate (column 4, lines 54-58; column 6, lines 30-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the adhesive of Massingill as modified by Shrauger, such that it is cut to provide vents, as taught by Liberty. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide vents in the adhesive, so that air bubbles can be removed from between the substrate and dies, such that heat generated in the die can be effectively dissipated in the substrate (Liberty, column 1, lines 17-40), the bond strength between the substrate and die is kept strong, rather than being weakened by air bubbles, and the substrate and die are not damaged by moisture retention.

6. Claims 8 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Massingill et al. in view of Shrauger, as applied to claims 1 and 27 above, and further in view of U.S. Patent No. 6,490,166 to Ramalingam et al.

Smith fails to disclose perforations in the substrate.

Ramalingam discloses that the substrate has perforations for permitting the escape of gas during mounting of the dies (column 2, lines 33-41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the substrate of Massingill in view of Shrauger to include the perforations taught by Ramalingam. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide perforations in the substrate, because the perforations allow for the release of gas formed during the bonding process, which in turn strengthens the substrate/die interface, and protects the substrate from delamination or damages due to moisture absorption (Ramalingam, column 1, lines 30-44).

7. Claims 9 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Massingill et al. in view of Shrauger, as applied to claims 1 and 27 above, and further in view of U.S. Patent No. 5,368,880 to McKee et al.

Massingill discloses a template attached to the substrate, but fails to disclose that the template is bonded through a eutectoid layer.

McKee discloses bonding two structures using a eutectoid layer (column 1, lines 5-22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the optical integrated circuit of Massingill in view of Shrauger, such that the template is bonded to the substrate through a eutectoid layer, as suggested by McKee. The rationale is as follows: A person having ordinary skill in the art would have been motivated to bond the template and substrate with a eutectoid layer, because a eutectoid layer provides precise parallelism between the substrate and template (McKee, column 1, lines 5-22), which would increase the accuracy of die placement in the template, as well as providing a strong and

temperature-resistant bond that would not break upon die mounting, as is appreciated by one skilled in the art.

Allowable Subject Matter

8. Claims 10-12 and 36-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record, considered as a whole, fails to suggest alignment templates for semiconductor dice, which are specifically formed by an etched metal layer, a stamped metal layer, or an epitaxially grown semiconductor layer, with all of the structural properties inherent to each process. U.S. Patent No. 5,824,186 to Smith et al. discloses an alignment template formed from an etched semiconductor substrate layer, and U.S. Patent No. 6,312,551 to Murayama et al., as well as U.S. Patent No. 5,074,036 to Dunaway et al., disclose an alignment template formed by an unspecified process using a metal layer, but there is no motivation in the prior art to form these template layers out of the specified materials and processes, nor is there any suggestion in the prior art that an epitaxial semiconductor layer, a stamped metal layer, or an etched metal layer could provide the highly precise alignment tolerances required for optical integrated circuit packaging.

Response to Arguments

10. Applicant's arguments with respect to claims 1 and 27 have been considered but are moot in view of the new grounds of rejection.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 5,897,728 to Cole et al. and U.S. Patent No. 6,477,286 to Ouchi disclose the formation of a rectangular aperture for receiving and retaining a chip.

U.S. Patent No. 5,074,036 to Dunaway et al. and U.S. Patent No. 6,312,551 to Murayama et al. disclose metal frame layers attached to a substrate for die placement.

U.S. Patent No. 3,931,922 to Jackson et al. discloses a template formed of a stamped polyimide sheet.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (703) 305-3233. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd
July 23, 2003

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800